XKEYSCORE for Counter-CNE

"Using the XKS CNE dataset and a DISGRUNTLEDDUCK fingerprint, we now see at least 21 TAO boxes with evidence of this intrusion set, most of which are associated with projects aimed at Iran WMD targets." **-- MHS, July 2010**

March, 2011

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Overall Classification

The overall classification of this presentation is:

TOP SECRET//COMINT//REL TO USA, FVEY

What is XKEYSCORE?

- A suite of software running on a Linux host
- *Classically*, used for DNI processing, selection and survey
- A distributed hierarchy of servers at field sites and headquarters
  - Extract and tag metadata & content from traffic
  - Servicing analyst queries and workflows
- Web and programmatic front-ends

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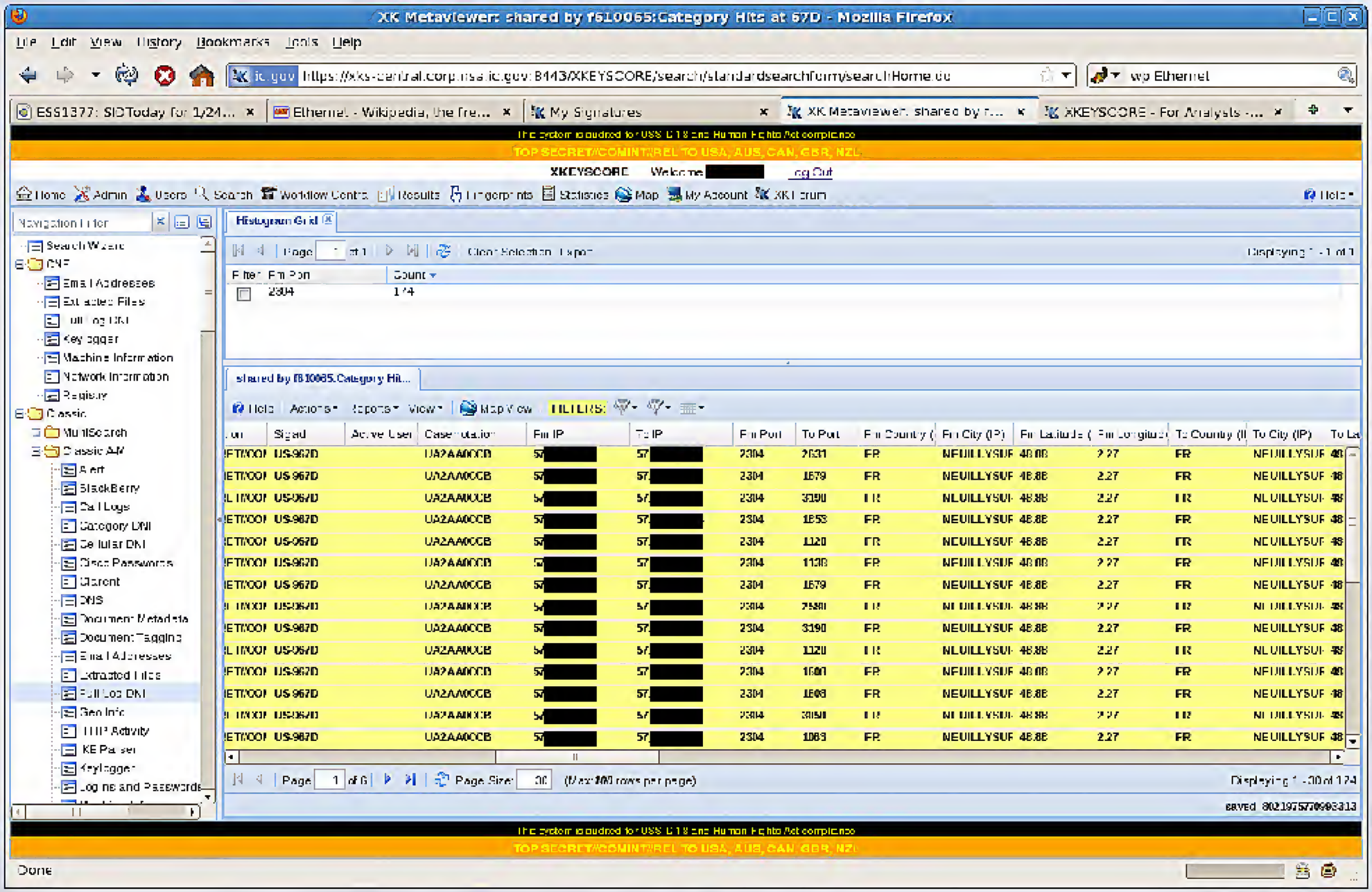
XKEYSCORE GUI



Example Search

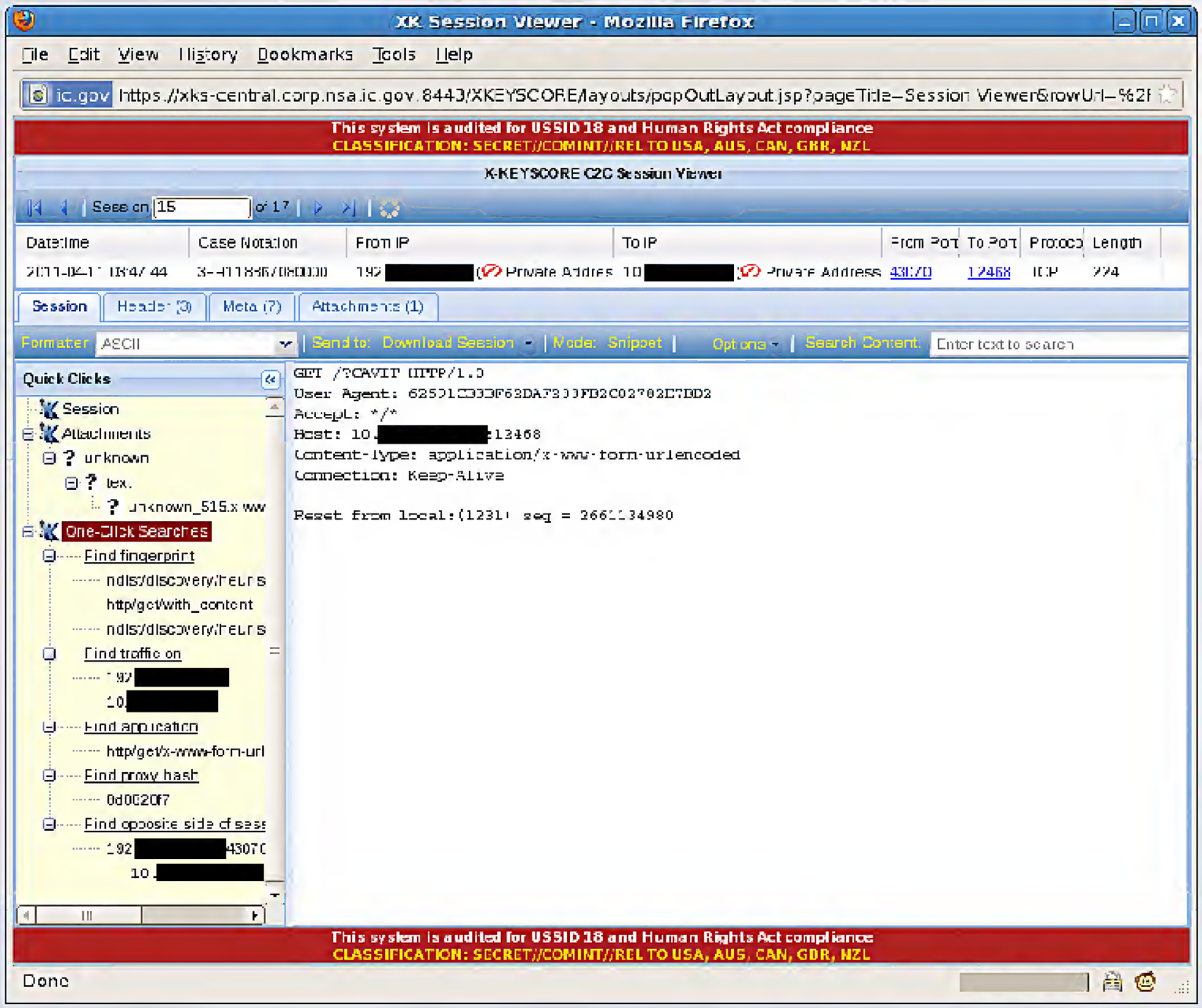
- Let's try a search for suspicious stuff...

  http_activity search, 5-eyes defeat, look for fingerprints:

  `ndist/discovery/heuristic/BHAM/get_with_content` or `http/get/with_content`

- While the search runs, some gotchas:
  - You choose where your query is run
  - Content and metadata age-off
  - Burden is on user/auditor to comply with USSID-18 or other rules
  - Geolocation based on IP

Search Results



Notes:

- Strange User-Agent
- Probably NOT CNE but definitely something non-standard
- Content: maybe a HTTP tunnel for some weird protocol?

`Reset from local...`

- Should we write a Fingerprint?

Fingerprints and Appids

- Useful for identifying classes of traffic or particular targets (for SIGDEV or collection):

  mail/webmail/yahoo

  browser/cellphone/blackberry

  topic/s2B/chinese_missile

- appid – a contest, highest scoring appid wins
- fingerprint – many fingerprints per session
- microplugin – a fingerprint or appid that is relatively complex (e.g. extracts and databases metadata)

Fingerprints and Appids (more)

- Written in language called "GENESIS" (go genesis-language):

```
appid('encyclopedia/wikipedia', 2.0) =
   http_host('wikipedia' or 'wikimedia');
fingerprint('dns/malware/MalwareDomains') =
   dns_host(' erofreex.info ' or ' datayakoz.info '
   or ' erogirlx.info ' or ' pornero.info ' or ...
```

- If a fingerprint contains a `schema` definition, a search form automatically appears in the XKEYSCORE GUI
- Power users can drop in to C++ to express themselves

More about searches

- Many different searches
  - Base search is **Full Log DNI**
  - Depending on traffic type, will generate searchable results for (example):

HTTP Activity	Network Information	GEO Info
Extracted Files	Email Addresses	Registry
Logins and Passwords	Document Metadata	Machine Info

- workflow – a user query that is run automatically usually every 24 hours

XKEYSCORE Gotchas

- Not all sites run latest XKEYSCORE software or fingerprints
- fingerprint submission:
  - XKEYSCORE team weighs mission-worthiness of user fingerprints vs computational cost
- Content and metadata ageoff

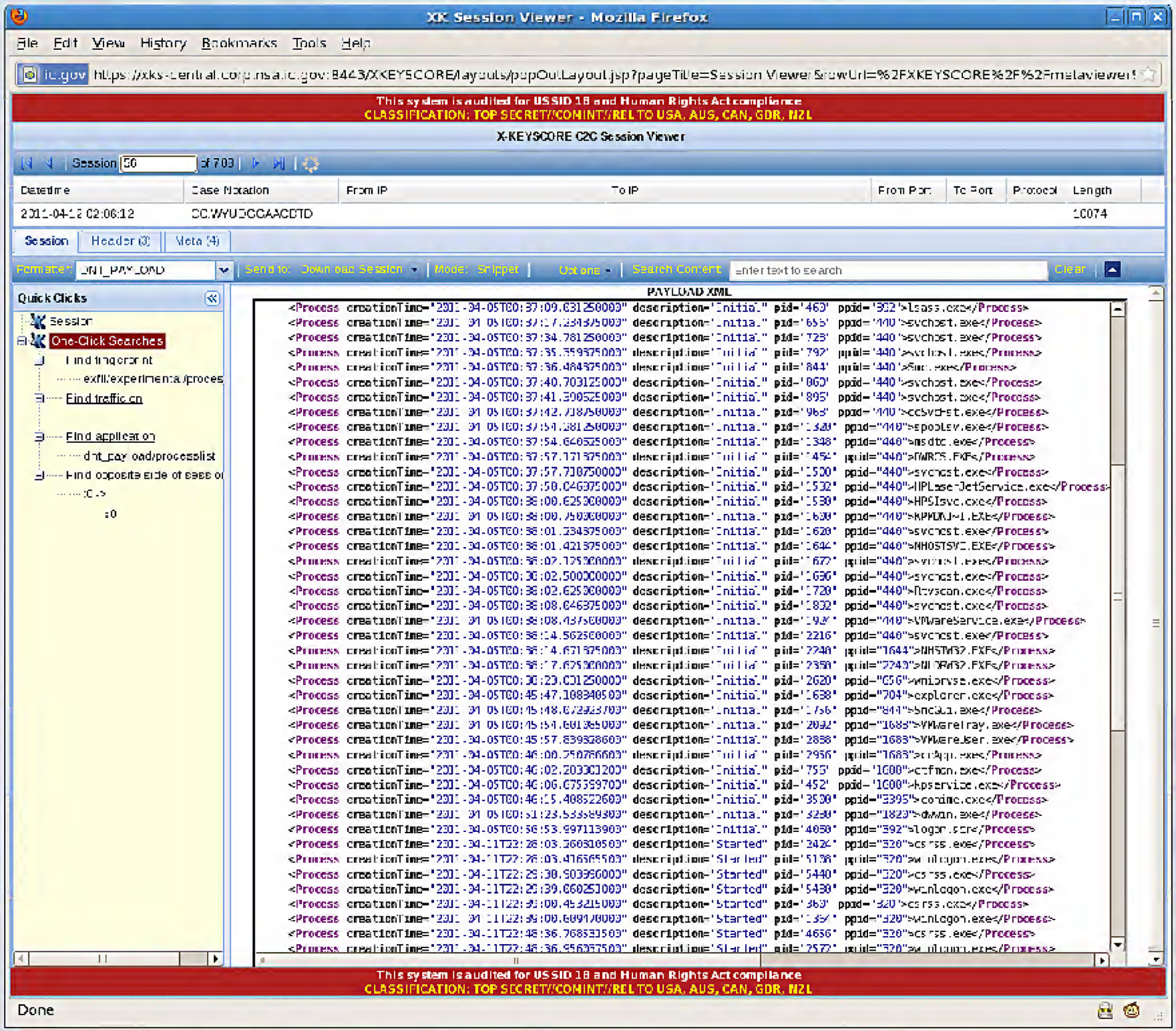
XKEYSCORE CNE

- Lots of endpoint data flows into XKS
  TAO (no ECIs), GCHQ (almost all)
- Other limited flows include SIGINT Forensics Center, TAO STAT
- XKEYSCORE works well for endpoint data
- Sometimes the paradigm breaks (e.g. collected browser history file)

XKEYSCORE CNE (more)

- Payload types:
  `dirwalk, extracted file, system survey, network config, captured credentials, registry query, key logger, etc.`
- Labeled `dnt_payload` in appid/fingerprint ontology
- Let's look at some DANDERSPRITZ data...

XKEYSCORE CNE (more)



XKEYSCORE CNE (more)

- Recent Developments
  - Upgrade of XKEYSCORE CNE
  - Keyloggers: keylogger/perfect/extension
  - PCAP Reingestion
  - Router Redirection

Counter CNE Methodology

(refer to Counter CNE Resources slide...)

- Hypothesis/research-driven
  - "Could South Korean CNE be using similar selectors to FVEY CNE?"
  - "What keywords could be used to find keyloggers ("example: keylog OR keystroke")
- Bogus or Unusual Traffic
  - HTTP GET with content (example in this presentation)
  - HTTP POST at odd hours (from Russia 0200-0359Z)
  - Funky user agents
- Known-Host or User driven (e.g. drop sites)
- XKEYSCORE is GOOD at these kinds of things

CNE-Specific

- Registry searches (e.g. SIMBAR)
- Fused Active/Passive search
  - common selectors
  - document hashes
- Known Processes (malicious executables or code)

  ... Let's enhance the process list appid
- map-reduce within CNE cluster using GENESIS calls

XKEYSCORE Doesn't Do...

- ... at all (well, automatically, anyways)
  - Paired traffic heuristic-based approach
    - HTTP[S] imbalance (e.g. GET without response)
    - IP/DNS mismatch*
- ... on an automatic basis
  - Network or host characterization
  - Changes in IP/DNS mapping over time
  - Changes over time in malware comms

Counter CNE Resources

- *How to Discover Intrusions [using XKEYSCORE]* by [redacted] and [redacted] (paper)
- MHS INDEX – Foreign CNE Discovery Page
  https://wiki.itd.nsa/wiki/Foreign_CNE_Discovery
- CSEC and GCHQ – DONUT (unknown protocols):
  https://tiso.sigint.cse/snipehunt/index.php/DONUT
- GCHQ Discovery Posted some Research of Detecting Man-on-the-Side Attacks:
  https://tiso.sigint.cse/snipehunt/index.php/MOTS

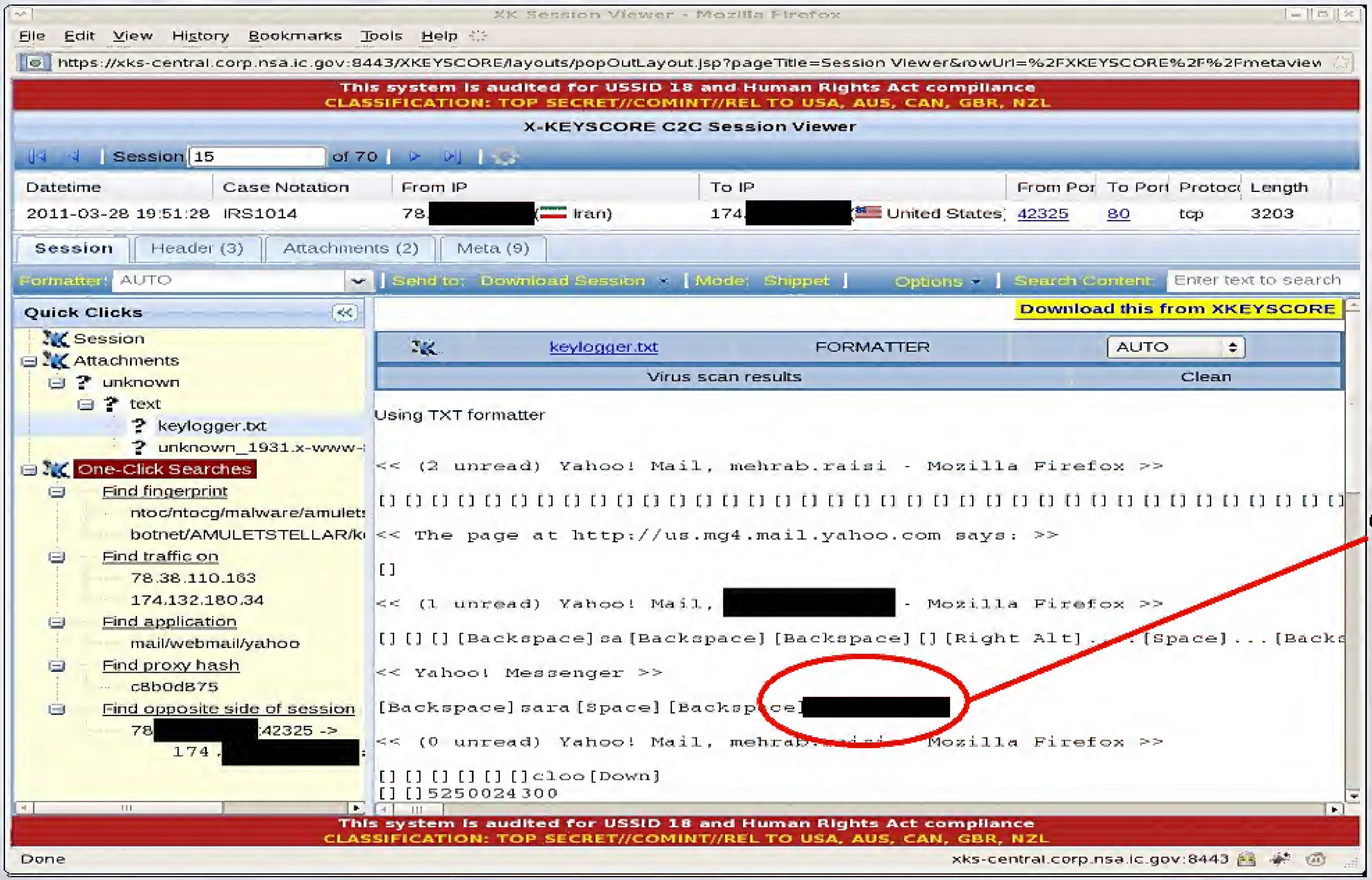
GCQH Disco Team posts POC's for different Intrusions and some Details:
https://wiki.gchq/index.php/Discovery

- The GCHQ DISCO team also posts Discovery Theories they run once a week:
  https://wiki.gchq/index.php/Discovery_Afternoons
- XKEYSCORE Fingerprints

Success Story – MHS INDEX

KEYSCORE

Using TAO-obtained Iranian implant encryption keys, inline decrypt using XKS microplugin – IRGC-QF keylogger data!



- **Login**

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